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At the Leland Stanford, Jr., University Mr. F. Atheling has been appointed assistant in mathematics and Mr. F. B. Baum assistant in electrical engineering.

THE corporation of Brown University will hold its annual meeting on September 8th. A successor to President Andrews will probably not be selected, but a committee will be appointed to consider the question. The report now goes that the Rev. Edward Judson, pastor of a Baptist church in New York city, is likely to be selected. The President of Brown University must be a Baptist.

MR. J. A. JOHNSTON has been appointed professor of physics and mechanics at the Royal Agricultural College at Cirencester.

DRS. LENK AND FLEISCHMANN, associate professors of mineralogy and zoology, respectively, at Erlangen, have been promoted to full professorships. Dr. Heim has been appointed professor of botany in the Agricultural College at Vienna.

DISCUSSION AND CORRESPONDENCE.

BASIL VALENTINE.

TO THE EDITOR OF SCIENCE: The very interesting article by Mr. C. S. Pierce in your issue of August 12th reminds me that several years ago I bought, in Brentford, England, a Latin edition of the 'Triumph-Wagen des Antimonii,' published in 1646. As Mr. Pierce makes no mention of this edition, it may possibly be worth while to call attention to it. The title-page reads as follows:

"CURRUS TRIUMPHALIS ANTIMONII: FRATRIS BASILII VALENTINI Monachi Benedictini. OPUS *Antiquioris Medicinæ & Philosophiæ Hermeticæ studiosis dicatum.* E Germanico in Latinum Versum opera, studio & sumptibus Petri Joannis Fabri Doctoris Medici Mospeliensis. *Et notis perpetuis ad Marginem appositis ab eodem illustratum.* TOLOSÆ. Apud PETRUM BOSC, M.DC.XLVI."

Dr. Faber dedicates the book to the 'illustrissimo ac reverendissimo D.D. Carolo de Montchal, Archiepiscopo Tolosano Regis Christianissimi Consiliano Meritissimo.' He also contributes an introduction. "The book was the

property of one Samuel Whitlock, who has made numerous marginal notes.

"The existence of this edition, while proving nothing, appears to show that about forty years after the original publication no doubt was entertained as to the authorship of the work."

T. D. A. COCKERELL.

MESILLA PARK, NEW MEXICO, August 16th.

SCIENTIFIC LITERATURE.

Fossil Plants for Students of Botany and Geology.

By A. C. SEWARD, M.A., F.G.S. With Illustrations. Vol. I. Cambridge. 1898. Pp. xviii+452. Cambridge Natural Science Manuals. Biological Series.

There has been for many years an increasing demand for a work on fossil plants that shall be at once comprehensive, scientific, and sufficiently popular for the lay student. Balfour's 'Introduction to the Study of Palæontological Botany,' Edinburgh, 1872, was too elementary, and was restricted to British material. Saporta's 'Monde des plantes avant l'apparition de l'homme,' Paris, 1879, comes nearer to the ideal, but it is now old and out of date in view of the rapid advance of the science. 'L'évolution du règne végétal,' by Saporta and Marion, in three small volumes, 1881-1885, is much more special and somewhat popular and an exceedingly suggestive work. Count Solms-Laubach's 'Einleitung in die Paläophytologie,' Leipzig, 1887, is the work of a specialist, and proceeding professedly from the botanical standpoint does not claim to cover the whole field, and is really a series of special investigations, largely confined to internal structure, and arranged in no systematic order (*e. g.*, the 'Cycadeæ' are treated before the ferns, and the Calamariæ before the Lepidophytes). The English translation of this work, published four years after the German edition, contained no revision, although there had been great advance during this interval in solving the problems discussed.* Sir William Dawson's 'Geological History of Plants,' New York, International Scientific Series, 1888, is little more than the geological history of the Devonian of Canada, although a pleasant book. The second part of Zittel's

* See SCIENCE, Vol. XVIII., No. 464, New York, December 25, 1891, pp. 360-361.

'Handbuch der Palæontologie' is a large volume and constitutes a manual of fossil plants. It was begun by Schimper in 1879 and completed by Schenk in 1890. It treats the subject systematically and, therefore, is only adapted to the use of the advanced student or special investigator. Schenk's subsequent abridgment of this, entitled: 'Die fossilen Pflanzenreste,' Breslau, 1888, so far from popularizing it, condenses it to such a degree that it is of little use even to the latter class.

The above-named seven works, to which might, perhaps, be added the 'Sketch of Paleobotany' in the Fifth Annual Report of the U. S. Geological Survey, Washington, 1885, and the article on fossil plants in Johnson's Universal Cyclopædia (Vol. VI., pp. 639-645), constitute about the only attempts heretofore made to present a general view of the science of paleobotany without introducing descriptions of species. Potonié's 'Lehrbuch der Pflanzenpalæontologie mit besonderer Rücksicht auf die Bedürfnisse des Geologen,' begun in 1897, has now reached the third fascicle, but it bids fair to be even more technical than any of those already mentioned.

We have now before us the first volume of another comprehensive work on the general subject of fossil plants, written by one who is thoroughly equipped for his task, especially from the botanical side, and the first question that arises is as to whether it responds in any more satisfactory way than the rest to the real demand in this line, viz., the demand already mentioned for popular scientific treatment of the whole subject of extinct plant life in its relation to living plants and to geologic time. To this question the answer must be decidedly in the negative. The work fills no 'long-felt want,' and must be regarded simply as another added to the considerable number of technical treatises designed for the advanced student only. It is remarkable how, in the production of such works, the general educational requirements are ignored and only those of special research considered. The leading motive with each author seems to be to see how much better he can treat the more advanced and recondite aspects of the subject than his predecessors have done, and thus we have a multitude of very

similar works, each making a slight advance upon the preceding one.

Dismissing, then, at the outset all idea of a new departure or a fresh and novel presentation of the science of fossil plants, such as should be calculated greatly to multiply the number of persons who interest themselves in them, let us apply ourselves to the task of examining the work as it is. A criticism of a book because it is not something else can be justified in a case like the present, where there is sore need of a form of treatment which the author is fully competent to furnish and proves that he has leisure to do by making a book for which there is no special call. Still, for English readers, and especially for the very small and constantly diminishing number of students who cannot readily handle the French and German languages, the present work will be grateful and far better than a translation. Moreover, I do not hesitate to say that, aside from its being fully up to date, it is decidedly the best of the works thus far produced. Of course, this ought to be the case, not only because it is the latest, whereby all previous contributions could be laid under tribute and their defects profited by, but also because it has as its author a man with an exceptional equipment for his task, especially as not being too great a specialist, *i. e.*, not having narrowed down to any one of the main lines, as is so often the case, which gives such an uneven and one-sided character to most works of the kind.

The work is divided into two parts, the first of which is called 'General' and occupies 115 pages, while the second, or 'Systematic,' part includes the remainder of the volume and may extend through the whole of the second volume. It is, therefore, essentially a systematic work.

The 'General' part consists of a 'Historical Sketch' of 11 pages; a chapter on the 'Relation of Paleobotany to Botany and Geology,' 10 pages; one on 'Geological History,' 32 pages; one on 'The Preservation of Plants as Fossils,' 39 pages; one on 'Difficulties and Sources of Error in the Determination of Fossil Plants,' 17 pages; and one on 'Nomenclature,' 6 pages. As a book for advanced students only, the historical sketch is merely formal and as-

sumes a knowledge of all the details, but gives some references. The second short chapter is merely introductory, and the third, which is a fairly good *résumé* of the stratigraphical conditions, with a columnar section after McKenny Hughes, and a treatment of each formation in ascending order, has the defect of failing to connect the several periods closely enough with the forms of vegetation specially characterizing them. As the treatment in Part II. is botanical and not geological, this could only be done here. A fine opportunity is therefore lost.

The fourth chapter, treating of the mode of deposition of plants, is excellent and opportune, and is the best summing-up of an obscure but important subject that we have. The author seems to have realized the need of such a survey and has made it correspondingly clear that most of the popular error relating to fossils is due to ignorance of their modes of preservation in the rocks, and nothing could be more educative than a full and lucid presentation of the facts so far as known. It would be too much to expect this in a work devoted to fossil plants, but any light on the subject is valuable. Here, however, a general knowledge of geology is presupposed, and this chapter, which might well interest many geologists, is not adapted to the needs of the untrained reader.

The fifth chapter, on the difficulties to be overcome, is very cautiously written and cannot fail to exert a wholesome influence on workers in this field. It proceeds mainly from the usual standpoint of both botanists and geologists, who never tire of emphasizing the unreliability of paleobotanical data. Some excellent examples are given of the possibilities of error, and the author's modest disinclination to defend his cause seems to leave the case with the opponents of the science. This is better than an ardent defence, but he might at least have answered some of the objections that are based on ignorance of the science, and most of the cases are of this class. The errors that have been made are either due to superficial observation and poor work, or else they are committed by geologists themselves. Of this latter class are most of the instances where 'problematical organisms' coming from early formations have been referred to the plant kingdom and called

'fucoids' or 'algæ.' It is the geologists and 'paleontologists' who have done most of this, and the paleobotanists, who came later, merely found them there. They, however, are always held responsible.

As an illustration of possible carelessness on the part of paleobotanists, we may take the case mentioned by our author on page 97 of the similarity of some *Polygonums* to *Equisetum*. He says: "Without a careful examination of the insignificant scaly leaves borne at the nodes this mistake might be made." The answer is that the careful investigator would not overlook these characters, however 'insignificant.' So, too, the case of *Kaulfussia*, a fern so unlike those with which we are familiar, simply shows the necessity that the paleobotanist acquaint himself with all kinds of ferns and not be limited to those of his particular neighborhood or country.

Botanists, acquainted only with plants as they now exist, have, as a general thing, not grasped the meaning of modification with descent, although they may often borrow that phrase from Darwin and apply it in a vague sense. They, therefore, have no patience with fossil plants that differ considerably from living ones, and think it foolish to try to name and classify them. When it was discovered that *Baiera*, which had first been classed as a fern, belonged to the line of *Ginkgo*, and had to be transferred to the *Taxaceæ*, it was thought that the paleobotanists had been guilty of an egregious mistake. But now that *Ginkgo* has been found to bear antherozoids, and therefore to be much nearer to a fern than to a yew, the mistake is found to have been that of the botanists, while the paleobotanists, in referring it to the ferns, had come much nearer to truth.

In Part II. the treatment is from the lowest forms upward; but this volume closes long before the *Pteridophyta*, or *Vascular Cryptogams*, have been disposed of. In fact, only two classes of them are treated, the *Equisetales* and the *Sphenophyllales*. Over 100 pages are devoted to the *Thallophyta* and only 13 to the *Bryophyta*. Nearly all the classes are briefly treated, whether any of them have been found fossil or not. In a large number, however, fossil forms have been reported, and the field of extinct

micro-organisms is now one of the most fascinating departments of paleobotany. To mention some of these in their systematic order, we have the Coccoliths of the Lias and Cretaceous made known by Sorby and Rothpletz, though their botanical position is doubtful; the calcareous algæ (Schizophyceæ) of various seas, including our Great Salt Lake; the oolitic grains containing calcareous tubes in rocks of various ages, some of which, as, *e. g.*, *Girvanella*, have been carefully studied and are very ancient (Ordovician); numerous forms, parasitic on fossil shells and corals, which bore into or through them and have puzzled the paleontologists.

Fossil bacteria are now well recognized and go back as far as the Devonian. Doubtless they were really coeval with the primal origin of life, if they did not themselves constitute it.

The old subject of fossil algæ, or fucoids (Bilobites, Eophyton, Spirophyton, Fucoides, etc.) is disposed of very briefly. As these objects show no internal structure their true nature must remain problematical. Most of them are closely imitated by tracks made by various marine animals, and Mr. Seward seems to agree with Nathorst and others in accounting for them in this way. *Oldhamia* and *Dendrophyucus* are believed to be of mechanical origin.

Upon fossil diatoms there is now an immense literature and Mr. Seward scarcely more than refers to it. He discredits, however, entirely the claim of Castracane to have found them in the Carboniferous. They are mostly Tertiary, Pleistocene or Plankton.

Among the green algæ (Chlorophyceæ) in the family Siphoneæ there occur some interesting fossil forms. We have here the rare case of a genus founded on extinct forms and subsequently discovered in the living flora. Such is the genus *Acicularia*. This case has the additional peculiarity that when first described by D'Archiac it was regarded as an animal. Quite a number of other genera of this group are found chiefly in the Eocene of the Paris basin, but also in older formations, *e. g.*, *Cymopolia*, *Dactylopora*, *Gyroporella*, *Sycidium* and *Vermiporella*, the last of which is Silurian. Throughout all this the general tendency has been to restore to the vegetable kingdom forms that had been regarded as animal.

Of red algæ (Florideæ, Rhodophyceæ) the principal fossil forms belong to the Nullipores, which form banks resembling coral reefs. The two best known genera are *Lithothamnion* and *Lithophyllum*. They are mostly Tertiary or Upper Cretaceous. The genus *Selenopora*, however, ranges from the Ordovician to the Jurassic.

To the brown algæ (Phæophyceæ) is referred the remarkable Prototaxites of Dawson, a land plant or tree of the Silurian and Devonian, first thought by Sir Wm. Dawson to be coniferous, as the name implies, but subsequently found to have nearly the structure of kelp, for which reason, contrary to the rules of nomenclature, Carruthers changed the name to *Nematophycus*, and still later Dawson and Penhallow proposed to call it *Nematophyton*, neither of which names can stand. Its history was popularly written by Sir William in his *Geological History of Plants*.

The fossil fungi are briefly treated with proper reservations and the opinion expressed that Meschinelli's list in the tenth volume of Saccardo's 'Sylloge Fungorum' 'includes certain species which are of no botanical value.'* The alleged Carboniferous fungus, *Incolaria securiformis*, described by H. Herzer from Ohio, in which the mycelia are said to be '1½ to 2 inches in diameter,' certainly did not deserve mention in such a work as this. The occurrence of fungi as diseases of fossil plants is an interesting fact and is properly dealt with.

Mr. Seward erects the Characeæ into a great group or subkingdom, the Charophyta, coordinate with the Thallophyta, Bryophyta, etc. The genus *Chara* is well known in the fossil state from the occurrence of great numbers of its peculiar so-called 'fruits,' consisting of the calcareous shells enveloping the oospores which always have characteristic spiral markings. Most of them come from the Tertiary, but they are found in the Wealden and the Jurassic, and one form strongly suggesting a *Chara* was found in Devonian rocks at the Falls of the Ohio and

*Since the appearance of Mr. Seward's volume Meschinelli has brought out a fine illustrated volume (*Fungorum fossilium omnium hucusque cognitorum Iconographia*, XXXI. tabulis exornata, Vicetia, 1898), which will furnish a basis for forming a more correct judgment of his work.

named by Dr. F. H. Knowlton *Calcisphæra Lemoni*.

Both of the great families of the Bryophyta, the Hepaticæ and the Musci, are found in the fossil state. Of the former the best known belong to *Marchantites* and closely resemble the common living liverwort *Marchantia*. They are found as low as the Oolite (*M. erectus* Leek-enby), but also in the Wealden and the Tertiary. For the family of mosses Mr. Seward does not even mention the numerous well authenticated forms so common in the peat bogs of Europe and in the amber, but confines himself to the ancestral types that have been called *Muscites*, one of which (*M. polytrichaceus* Renault and Zeiller) dates back to the Carboniferous. The absence of this type throughout the entire Mesozoic is doubtless accidental and will perhaps be supplied by future research. The other forms thus far known are Tertiary.

As already remarked, the present volume does not complete the great group or subkingdom of Pteridophyta, dealing only with the two classes Equisetales and Sphenophyllales, and leaving the two most important classes, Lycopodiales and Filicales, for future treatment.

The Equisetales include the fossil genera *Equisetites*, *Phyllothea*, *Schizoneura*, *Calamites* and *Archæocalamites*. These are all very fully discussed, and although the literature is large, especially that relating to the Calamariæ, still much of the information contained in this work is either new or supported by fresh illustrations. The author follows largely the line of Williamson's work, and his conclusions can be relied upon as the last word that the science has to offer. It would be too much to follow the various steps in his reasoning, and it must suffice to point out that, while retaining the genus *Archæocalamites* of Stur from the Devonian and Lower Carboniferous (Culm), he regards these pithcasts as probably forming a transition from true *Calamites* to *Sphenophyllum*, or, rather, to use his language, "we have evidence that the *Calamites* and *Sphenophyllum* were probably descended from a common ancestral stock, and it may be that in *Archæocalamites* some of the *Sphenophyllum* characters have been retained; but there is no close affinity between the two plants."

That Mr. Seward should have erected the single fossil genus *Sphenophyllum* into a class, Sphenophyllales, coordinate with the Lycopodiales, that include the Lepidophytes and the Filicales, or ferns, may surprise some botanists, but it must be remembered that, notwithstanding a certain superficial resemblance, *Sphenophyllum* has persistently refused to identify itself with *Calamites* or *Asterophyllites*, and that from the standpoint of internal structure, so far as known, it has proved wholly unique among fossil plants.

In 1894 Messrs. Williamson and Scott, after the most prolonged investigation, declared that "the genus *Sphenophyllum* cannot be placed in any existing family of Vascular Cryptogams. Anatomically there are some striking points of resemblance to Lycopodiaceæ, but the habit and fructification are totally different from anything in that order. *Sphenophyllum*, in fact, constitutes a group by itself, which is entirely unrepresented in the present epoch, and the affinities of which cannot be determined until additional forms have been discussed."* Mr. Seward scarcely more than iterates this view when he says that "the genus *Sphenophyllum* is placed in a special class, as representing a type which cannot be legitimately included in any of the existing groups of Vascular Cryptogams. Although this Paleozoic genus possesses points of contact with various living plants, it is generally admitted by paleobotanists that it constitutes a somewhat isolated type among the Pteridophytes of the Coal Measures. Our knowledge of the anatomy of both vegetative shoots and strobili is now fairly complete, and the facts that we possess are in favor of excluding the genus from any of the three divisions of the Pteridophyta." He then proceeds with full descriptions and excellent illustrations to work out all the characters of the genus. There is scarcely a better example of what has been called a comprehensive or prophetic type in botany, and Mr. Seward has well expressed this view in the following words: "To put the matter shortly, *Sphenophyllum* agrees with some Lycopodinous plants in its anatomical features; with the Equisetales it is connected by the verticillate disposition of the leaves, and some of the

*Proc. Roy. Soc., London, Vol. LV., p. 124.

forms of *Sphenophyllum strobili* present features which also point to Equisetinous affinities." As to the probable derivation or genealogy of this form he quotes the Presidential address of Dr. D. H. Scott, made to the Botanical Section of the British Association in 1896, as follows: "One may hazard the guess that this interesting group may have been derived from some unknown form lying at the root of both Calamites and Lycopods. The existence of the *Sphenophyllæ* certainly suggests the probability of a common origin of these two series."*

In the above hasty sketch only a few salient points have been seized merely as samples of the character of the work, and the reader must go to its well laden pages if he is to obtain any adequate idea of the wealth of information that it contains. Teachers and advanced students, or even original investigators along these lines, will await with some impatience the appearance of the second volume.

LESTER F. WARD.

WASHINGTON, D. C.

SCIENTIFIC JOURNALS.

THE *Astrophysical Journal* for August opens with an article on observations on stellar motions in the line of sight contributed from the Emerson McMillin Observatory by Professor H. C. Lloyd. There is an article on the concave grating by Mr. S. A. Mitchell and a number of minor contributions. The greater part of the number is, however, taken up by an article on the series spectra of oxygen and sulphur and selenium by Drs. Runge and Paschen.

THE September number of the *Educational Review* contains articles by Hugo Münsterberg on 'Psychology and Education;' Gabriel Compayré on 'Contemporary Education in France;' William T. Harris on 'The Use of Higher Education;' Charles W. Eliot on 'The Older and the Newer Colleges;' Friedrich Paulsen on 'Examinations;' Walter L. Hervey on 'What German Universities offer to American Students of Education,' and Hiram M. Stanley on 'The Teaching of Psychology.'

THE current number of the *Atlantic Monthly*

* British Association Reports, Liverpool Meeting, 1896 (1897), p. 1006.

contains two articles of special interest to men of science. Dr. W J McGee takes the fiftieth anniversary of the American Association as the occasion for an article on the advance of science during that period, patriotically maintaining that America must be credited with one-half of its progress. Professor Simon Newcomb contributes the second installment of his 'Reminiscences of an Astronomer,' describing his astronomical work abroad and his visits to European observatories. Professor Newcomb demonstrates that scientific eminence is compatible with an admirable literary style.

THE announcement made in this JOURNAL some time since of the plan for the publication of a journal by the Illinois Hospital for the Insane has been carried into effect by the issue of the first number of a quarterly journal to which the queer name *The Psychiatrist* has been given. It contains four articles by members of the staff of the Hospital: 'Professional Work in Hospitals for the Insane,' by Dr. W. G. Stearns; 'Three Cases of Brain Tumor,' by Dr. A. F. Lemcke; 'The Early Diagnosis of Paretic Dementia,' by Dr. V. Podstata, and 'Laboratory Psychology as applied to the Study of Insanity,' by Dr. W. O. Krohn. The number extends to 66 pages; the subscription price is \$2.00 per annum.

THE *Journal of Tropical Medicine*, edited by Dr. James Cantlie and Dr. W. J. Simpson, and published by Messrs. John Bale, Sons & Danielsson, London, began publication on August 15th, and will be issued monthly hereafter. The first number is mainly occupied by the report of the proceedings of the Section of Tropical Diseases, at the annual meeting of the British Medical Association in Edinburgh.

NEW BOOKS.

Lehrbuch der anorganischen Chemie. DR. H. ERDMANN. Braunschweig, Friedrich Vieweg und Sohn. 1898. Pp. xxvi + 756. 18 Marks.
A Text-book of Geodetic Astronomy. JOHN F. HAYFORD. New York, John Wiley & Sons; London, Chapman & Hall. 1898. Pp. ix + 351.

Laboratory Directions for Beginners in Bacteriology. VERANUS A. MOORE. Ithaca. 1898. Pp. vi + 89.